



H.F.C.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Asad A. Khan et al.  
Serial No.: 09/961,441  
Filing Date: 09/24/2001  
Title: "BACK LIT CHOLESTERIC LIQUID CRYSTAL DISPLAY"  
Group Art Unit: 2814  
Examiner: Steven H. Rao  
Docket No.: KENT.35601

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DECLARATION BY DR. ASAD A. KHAN

I, Dr. Asad A. Khan, hereby declare and state:

1. I am Vice President for Research and Development at Kent Displays Inc. (the present assignee) and currently working on improving and characterizing cholesteric materials for various applications of ChLCDs. I am a co-inventor of seven U.S. patents and several pending U.S. and foreign patents relating to cholesteric materials and displays, including the above-identified patent application. I am the author of numerous technical publications regarding liquid crystals. I have been employed by Kent Displays Inc. for ten years. I am a member of the Society for Information Display. I have a B.A. in Physics from the College of Wooster, an M.S. in Physics from Kent State University,

and a Ph.D. in Chemical Physics from the Liquid Crystal Institute at Kent State University.

2. I have read and understood the Office Action and the patent references applied therein to reject the claims of the subject patent application. Neither U.S. Patent 6,285,422 (Maeda) nor U.S. Patent 5,896,199 (Evanicky) discloses a bistable cholesteric liquid crystal display or the other features of the invention in combination.

3. To illustrate the differences between TN (twisted nematic) or STN (super twisted nematic) liquid crystal displays of the type disclosed in Maeda and the bistable cholesteric liquid crystal displays of the present invention, I conducted the following experiment. I used a TN type cell (6 $\mu$ m thickness, glass substrates, rubbed planar polyimide {90° between the two rubbing directions}, nematic mixture).<sup>1</sup> The display was placed between 2 linear polarizers and the stack placed on a white light source (CCFL + diffuser). When the polarizers were crossed, the display in the off state appeared bright. When the polarizers were parallel, the display in the off state appeared dark. When the back polarizer was replaced with the bi-directional circular polarizer of this invention, which circularly polarizes light in two directions,<sup>2</sup> the display in the off state did not produce appropriate contrast in either case. This stems from the fact that the bi-directional circular polarizer includes a  $\lambda/4$  plate on each side of a linear polarizer and therefore linearly polarized light does not leave this polarizer.

4. The foregoing experiment illustrates the well-known principle that TN and STN liquid crystal displays require linearly polarized light for achieving their intended purpose of displaying images. The experimental TN liquid crystal display did not operate according to its intended purpose when the linear polarizer was replaced with a bi-directional circular polarizer. Maeda's "polarized light separator" produces linearly polarized light as it is a reflective circular polarizer (cholesteric layer) coupled with a  $\lambda/4$  waveplate. Based on this experiment, Maeda's TN or STN liquid crystal display would not be operable for its intended purpose if Maeda's linear polarizer ("polarized light separator") were replaced by a bi-directional circular polarizer or otherwise modified such that circularly polarized light, rather than linearly polarized light, reaches the TN or STN display.

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<sup>1</sup> It is well known that the liquid crystal of a TN or STN display is not a cholesteric liquid crystal. It does not include focal conic and planar textures.

<sup>2</sup> The bi-directional circular polarizer was sourced from Nitto Denko as a custom ordered part according to my specifications. Prior to the filing date of the subject patent application I was unaware of an existing bi-directional circular polarizer, although I expected that polarizer manufacturers such as Nitto Denko and Polaroid could make one at my request.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

By: Asad A. Khan

Dr. Asad A. Khan

Date: 7/15/5